SCIENCE.—SUPPLEMENT.

FRIDAY, DECEMBER 18, 1885.

THE MIND-CURE.

THE attraction of the mysterious is proverbial; and, as no satisfactory explanation has yet been offered for the series of phenomena which are included in the term 'mind-cure,' it is not surprising that the general interest in it keeps alive. The facts are both too old and too new to be ignored. From the time when Moses lifted up the brazen serpent in the wilderness, and assured those who had been bitten by the desert scorpions that if they looked fixedly at it they would recover, down to the present day, when the faithful Catholics visit Lourdes in crowds, religious, psychological, and medical records have contained 'authentic' accounts of mind-cures. The facts have been heralded under different names, — 'miracles,' 'mesmerism,' 'animal magnetism,' 'spiritualism,' 'expectant attention,' the 'faith-cure.' They have always aroused attention, they have given rise to many theories and endless disputes, and they have baffled explanation. The last attempt to solve the problem[1] is no more satisfactory than others. What are the phenomena with which it tries to deal?

If you fix your mind upon one of your fingers, and look at it steadily for five minutes, you will become conscious of sensations in that finger which were previously unnoticed. If the finger happens to be cut, the pain will become more acute, and it may begin to bleed. If it does bleed, and you feel alarmed, you will breathe more rapidly, your heart may palpitate, and your face will turn pale: you may even faint away. This is a simple series of phenomena which illustrate the interactions of mind and body. If you happen to have overeaten, and in consequence begin to suffer from indigestion, you will notice not only a physical discomfort in the stomach, but also an indisposition to mental effort, an undue weariness on slight emotion, a growing inclination to look upon the dark side of things, and, if the dyspepsia becomes chronic, a decided persuasion that your financial affairs are becoming involved. Niemeyer relates a story of a very wealthy man whom he treated for chronic catarrh of the stomach. During the disease he thought he was near bankruptcy, and left unfinished a building that he had begun, because he thought he had not sufficient money to continue it. After spending four weeks at Carlsbad, his old strength and feelings returned, and he finished his house with great splendor. Probably there is no one who cannot recollect some instance equally striking of an influence of bodily condition upon mental action.

The facts of central localization of late established, have been thought to bear somewhat upon this subject. Every portion of the body sends in a set of nerve-threads to a corresponding portion of the brain, so that an imaginary map of the organs and surface can be pictured upon the surface of the cerebral hemispheres. The changes in any organ are therefore communicated to the part of the brain which presides over the organ; and, conversely, changes in that part of the brain may be communicated in turn to the organ. If we accept the theory that when the attention is directed to an organ its part of the brain is thrown into activity and becomes highly receptive and highly potential, we have simply advanced from one set of facts to another without at all touching the problem of how the interaction is brought about.

There are certain affections, however, which can be explained satisfactorily only on the theory that the disease lies, not in the organ which is supposed to be affected, but in the part of the brain which corresponds to it. If my finger is receiving impressions of heat or cold which pass unnoticed until I think of the finger, it is conceivable that my attention might be held so closely to some startling sight, that even a severe and painful impression in the finger might be unheeded in my interest in the terrible spectacle. Soldiers in battle have been known to go on fighting, though wounded, without perceiving their wound. Here a true mental loss of sensation has been present. Conversely, I may be in such a state of expectation regarding an organ, that a slight sensation in that organ may be misinterpreted and exaggerated till it corresponds with the expected feeling. At night, in the dark, how our youthful fears have been excited by a slight noise in the room! The story goes, that a French convicted criminal was told that he was to be bled to death; and when his eyes had been bandaged, and his arm touched with a cold iron, drops of water were allowed to fall into a basin at his side, where he could hear them. He gradually became more and more pallid, and at

[1] *Mind-cure on a material basis.* By SARAH E. TITCOMB. Boston, *Cupples, Upham, & Co.*, 1885. 8°.

last it was impossible to resuscitate him, though not a drop of his blood had flowed. Here the mental sensation was so intensified by attention and expectation, that general bodily effects of a fatal character ensued. The experiments of Mesmer and Braid are familiar to the older generation. To the younger the miracles of Lourdes are equally well known. They all correspond to the facts already cited, and simply increase the weight of evidence in favor of the proposition that mind and body interact.

The question will at once arise, Are there any limits to this interaction? It is just here that parties divide. A scientific physician will affirm that even in certain organic diseases, where perceptible changes have gone on in the tissues, nature can effect in her slow but steady way most wonderful repairs. But that there are limits even to the powers of nature, is equally well proven. He therefore cannot believe that mental action, however strong, can restore an organ which is hopelessly destroyed, or can hasten the process of repair to such an extent that in an instant changes are produced which ordinarily require weeks. He is, however, familiar with the fact that many diseases whose mental effects are as evident and distressing as in the former class are not attended with organic change; that in these the organ lies quiescent, ready to do its work at any time under the proper stimulus; and that here an instantaneous cure of the disease is possible under certain circumstances. In a word, he believes that functional diseases may yield to mental influences, but that organic diseases cannot be greatly modified by them. On the other hand, the 'Christian scientists,' among whom Miss Titcomb may be classed, do not admit this distinction. Taking for granted the existence of thought-transferrence, they hold that "the cure of disease is affected by the idea of health becoming, unconsciously to the sick person, the dominant idea in the sick person's mind by transferred thought. Thus the mind-curer's mind is concentrated upon the idea that the sick person has no disease; and this idea being transferred from the active brain of the mind-curer to the passive brain of the sick person, it becomes there the dominant idea, and the sick person becomes well" (p. 13). A number of successful cases are related (pp. 46–48), but in none of them are there inherent evidences of the existence of organic disease. Asthmatic attacks, as is well known, come on at night, and pass off in the morning. It proves nothing, therefore, to state that such a patient was treated in the evening, and "when visited the next day was found to have recovered entirely" (p. 49). Further, "A gentleman residing in the same street with the writer was very ill with Bright's disease. He had been delirious for weeks, and all hope of his recovery had been abandoned. On passing the house one day, the writer gave the patient, whom she had never seen, a 'treatment.' She found afterward, upon inquiry, that the patient had recovered from his delirium almost immediately after the treatment was given. She continued to treat the patient, unknown to him or his family, for a fortnight, when she learned that he was able to be up and about the house" (p. 50). Now, aside from the facts that delirium rarely occurs in Bright's disease, and never 'for weeks,' and that the majority of cases recover spontaneously, according to a high authority, the query arises, whether the 'treatment,' which was given in this manner, had as much effect as the medicines the man was probably taking — especially as the 'treatment' seems to have consisted simply in a 'concentrated thought' on the part of a party unknown to the man. This reminds us of the tales of witchcraft, with a somewhat heightened degree of improbability. *Post hoc* with Miss Titcomb is equivalent to *propter hoc*. But a sober criticism will not hesitate to condemn such statements, because they assume not only the universal action of 'unconscious cerebration,' but also the possibility of general thought-transferrence, — a fact which is disproved both by the English and more strongly by the American society of psychical research (*Science*, July 3, 1885). If the logic of such reasoning is questionable at the start, the conclusions are hardly worthy of a mention. But this is a fair sample of much of the reasoning which has resulted in so-called explanations of the mind-cure. Start with a theory not based on facts to explain certain phenomena which have not been established as facts. It is evident that for an explanation of mind-cures we shall have to seek further.

That there are authenticated cases of sudden recoveries from serious affections of a functional nature, is admitted by all. That the intimate connection of mental and bodily action in health and disease exists; that such connection has a basis in anatomical structures, which are chiefly nerve-fibres; that nervous influences may pass over these fibres from the organ to its corresponding brain area, or in the opposite direction; and that under great mental strain or excitement the passage of such influence may be either suspended or greatly increased in intensity, producing unexpected effects at either end of the transmitting-fibre, — are facts which are proven by experiment and observation. To go beyond the facts is to venture into a maze of theories, none of which can satisfy a logical mind.

A. M.

LAYING A CABLE.

IT was not much of a cable, after all, and its laying was no great performance, although forty years ago it might have been considered a marvel.

Science, in its so-called practical aspects, is now advancing in parallel lines; and these are so numerous, and some of them so far-reaching, that most men are unable to follow along more than one or two. This fact has suggested the idea that there may be something of interest to many in a description of this cable, and of the operation of putting it in the water.

It does not connect us with any foreign country; it does not complete the girdle round the earth: it is modestly content to serve as the link which joins the intelligence of the rest of the world with that of the interesting and important islands, Martha's Vineyard and Nantucket, where formerly the influence of the whale prevailed over all else, but now, alas! tributary to the state of Massachusetts, from which comes good government, and to the Standard oil company, from which comes petroleum, that arch enemy of the whale trade. But exclusiveness, even when aided by insulation, must give way to the progress of events. A glance at the map will show the nature of the forces operating in this case. Vineyard Sound is the great highway of the coasting trade. Thousands of vessels of all kinds pass through it every year. The harbors of Vineyard Haven (correctly named), Tarpaulin Cove, Lambert's Cove, etc., afford shelter for hundreds during rough weather. Wrecks are, unfortunately, not infrequent; and a visitor from the outside world is likely to see in the simple but perfectly neat and thrifty-looking home of the fisherman-farmer a carved and upholstered chair, or something of the kind, which is referred to with no little pride as a relic from the wreck of some passenger-steamer which went ashore with the loss of many lives and much property upon the coast near by.

The principal and sufficient reason for asking for a special appropriation from congress to secure telegraph communication with the mainland, was that stations of the U.S. signal service might be established on the islands, and particularly that danger-signals might then be displayed from the more prominent points for the guidance of the numerous sailing-craft constantly passing through the sound. Some years of effort were rewarded with success at the last session, an appropriation of forty thousand dollars having been made for the purpose of laying the necessary cable, amounting in all to less than thirty miles, and for erecting the land-lines, display-stations, etc. The work has been done, therefore, under the direction of the chief signal-officer.

The cable was made in London, and shipped to New York in the hold of a steamer, coiled in two large tanks especially built in the steamer for that purpose. It fortunately happens that the gutta-percha insulation, used almost exclusively for submarine cables, is improved and preserved by being kept damp, cracking and deteriorating when dry. For this reason it is necessary to keep the cable in tanks during its passage, so that it may be kept covered with water. The conducting part of the cable consists of seven copper wires, each about .028 inch in diameter, six being twisted about the seventh as a centre. The resistance of this conductor was not to exceed thirteen ohms per nautical mile, and it fell considerably short of that upon being measured. This copper core was covered with three or four layers of gutta-percha, until the diameter of what might be called the cable proper was a little more than a quarter of an inch. Such a cable would scarcely last while it was being put down, and it is therefore necessary to put an 'armor' upon it, so that it may be able to endure the destructive agencies to which it is likely to be subjected. The gutta-percha-copper core is wound with two or three layers of heavy jute twine, and this, again, with twelve number five galvanized iron wires laid on spirally. The result is apparently a strong iron rope about an inch and a quarter in diameter.

An examination of the cable was made in New York City, before its removal from the tanks referred to, for the purpose of seeing that its insulation was still intact. It was then transferred to a barge lying alongside, from which it was to be laid, and in which it was towed through the sound to Vineyard Haven. Its arrival at this place caused little less than a sensation. The first section of the cable was to be placed across Vineyard Sound; and, although not the longest, it was the section likely to cause the greatest anxiety. In fact, the Western union telegraph company has several times tried to place and maintain a cable from West Chop light on Martha's Vineyard to Nobska Point on the mainland, but their efforts have not been altogether successful. The damage to a cable across the sound arises from two sources. The tidal current is strong, at some points nearly three miles per hour; the seaweed, which is carried back and forth by this current, is caught on any suspended or exposed part of the cable, and twisted around it until huge, solid masses are attached to it, which offer so much surface to the swift current that the cable must give way under the strain. The other source of danger is quite as disastrous, and nearly as uncontrollable. It

is in the dragging of ships' anchors across the line of the cable. In this way the cable is caught in the anchor and brought to the surface when the latter is hoisted. A little intelligence combined with good nature would enable the shipmaster to release the cable and drop it uninjured; but more frequently, in his annoyance, he will deliberately cut it in order to escape, although release without injury could be accomplished in less time. In putting in this cable, it was desirable to locate it so that the chances of damage from both of these sources might be reduced to a minimum. To this end the officers in charge of its laying did not need to seek advice from persons familiar with the waters, for it was freely offered by every inhabitant of the islands. The multitude included a few old sea-captains, who seemed to know every foot of the coast, and to understand the nature of the bottom of the sea; and it is believed that their words were words of wisdom. The route selected lay across the sound several miles to the westward of that already referred to. It is undoubtedly freer from probable damage arising out of the anchorage of vessels, but time alone can determine to what extent.

Every thing being in readiness, the barge was towed to the starting-point, which was the northern terminus of the cable on Naushon Island. As there was a good deal of a 'sea' running, it was not possible to approach nearer than twelve hundred or fifteen hundred feet from the shore. The tug was anchored, and the barge was allowed to drift in a few hundred feet farther. A stout rope an inch and a half in diameter was then attached to the end of the cable, eight or ten men were put into a boat, and the other end of the rope was carried ashore. The end of the cable was dropped overboard, and the operation of pulling it to the beach began. This was finally successful, and the shore end was made fast to a stout post which had been erected for the purpose. All hands came on board, anchor was weighed, the barge made fast to the tug, and the journey across the sound was begun. The cable lay in two great coils in the barge, and dropped into the water over the stern. It passed around and over a couple of large reels or drums, where a large pulley-brake was applied to it in order to regulate the tension to which it was subjected. To one of the drums a counter was attached, so that the rate at which it was paying out could at any time be determined. Wind and tide opposed each other, and the rate of sailing did not exceed five or six miles per hour. The opposition of wind and tide was favorable to a straight course, and good pilotage secured a run across which undoubtedly put the cable down in almost exactly a straight line from the point of departure to the southern terminus on Martha's Vineyard. At this end the landing was a little more difficult. A rope was first carried ashore, its length measured as it went out, to determine where to cut the cable that it might reach the beach from the anchorage. On its next trip the little surf-boat carried a small, weather-worn 'A' tent, a rough bench, batteries, galvanometers, resistance coils, and two shivering signal-service men, who were to test the cable as soon as it was landed. A rude testing-station was soon established amid the hillocks of sand, and the instruments were in position when the cable was at last landed, and secured to a portion of the wreck of an unfortunate vessel that had stranded upon the shore many years before. But the high winds were still rising, darkness was coming on, and the captain of the tug, declaring that he had had enough of cables for one day, ordered all hands on board forthwith. It was impossible to leave the instruments in that condition, and the prospects for a night on the beach seemed good, when the hospitality of the owner of the one house within sight brought relief, furnishing a storehouse for the appliances, a well-supplied table for keen appetites, and a wagon-ride at night through the woods to the hotel, seven or eight miles away.

On the following day the termini were again visited, the ends properly secured, and the cable tested. A trench was dug in the sand down to low-water mark, in which the cable was buried. At a point above high tide on the beach a strong post was erected, to which the cable was secured by means of a heavy chain; from which point, still underground, it was carried higher up the sand-hills on which it had been landed, to the foot of an ordinary telegraph-pole. It extended up the side of this, being enclosed in a box until it reached the top, where it entered the cable-box proper, the end being secured to a binding-screw ready for connection later with the land-line. Some of the party had been sent to Naushon Island, carrying with them an ordinary telegraph instrument and key. By previous agreement it was to be connected with the cable at once on the arrival of the party. A few cells of battery and a similar instrument were joined to the end on Martha's Vineyard, and the two expeditions had been timed so accurately that almost instantly responsive ticks proved that intelligence was at work on the other side. Much interest is often felt in the first message transmitted through a cable or telegraph line. Brushing aside the romance of the thing, it is safe to say that in nine cases out of ten the first message is that which traversed the river first on this occasion, being

simply, 'Do you get me now?' After some further interchange of compliments, the operator on Naushon was directed to seal up the end of the cable by covering the exposed wire with gutta-percha. This having been done, communication ceased, and the insulation was tested. A number of battery cells were joined 'in series' to the galvanometer, which was a delicate instrument of high resistance, with a reflecting mirror, and to this the end of the cable was attached. The test was practically an endeavor to force the current through the gutta-percha insulation, the amount of the leak being measured by the deflection of the galvanometer needle. It had been demanded of the cable that it should show an insulation resistance of at least two hundred and fifty meg-ohms per mile, and it greatly exceeded this number when tested.

A few days later, when wind and weather were favorable, the island of Nantucket was connected in a similar way with Martha's Vineyard, the cable taking a sweep out into the sea to avoid shoals; and finally a short piece, about a mile in length, was made to connect Naushon, by way of the little island Uncatena (always 'Uncle Timmy' at home), with Wood's Holl, and thus was completed the union of these islands with the mainland, which it is hoped may last for many years.

M.

PHYSICS AT JOHNS HOPKINS.

THE large and well-appointed laboratories recently erected by the trustees of the Johns Hopkins university for the chemical and biological departments have by contrast made the more evident the needs of the physical department, which has been obliged to occupy temporarily parts of four different buildings. The trustees, recognizing this need, are now erecting a building for a physical laboratory. The new laboratory is to be a handsome building of red brick, trimmed with brown sandstone, and will occupy a fine site about a block from the other university buildings, on the corner of a quiet little street midway between the more important streets, which carry the bulk of the traffic of that region. It will therefore be as free from disturbance from the earth vibrations as could be expected in a city.

The building will be 115 feet long by 70 feet broad, and will have four stories besides the basement. In the centre of the building, and below the basement, are several vaults for instruments requiring to be used at constant temperature, also a fire-proof vault for storage. In these vaults will be placed Professor Rowland's dividing-engine, by which the diffraction gratings are ruled, and the Rogers-Bond comparator, which has recently become the property of the university. In the basement will be rooms for the mechanical workshop, for furnaces, and for piers for instruments requiring great stability. The first floor will include the main lecture-room, which will accommodate 150 persons, and rooms for investigations by advanced students in heat and electricity. The second floor will contain mathematical lecture-rooms, studies for instructors, and a room for the mathematical and physical library of the university.

The elementary laboratory will be on the third floor, which will also have rooms for more advanced work. The fourth floor will contain rooms for special work in light.

There will be a tower on the south-east corner of the building, which will have two rooms above the fourth floor. The upper of these will be provided with telescope and dome, and will be a convenient observatory when great steadiness in the instruments is not required. There will be power in the building for driving the machinery in the workshop and for running the dynamo-machines. A large section of the building is to be made entirely free from iron. The sash-weights will be of lead, and the gas-pipes of brass. Brackets will be attached to the walls, on which galvanometers and cathetometers may be placed. In order to avoid the inconvenience of having piers go up through the lower rooms, and yet to secure steadiness, beams have been introduced into the floors, which reach from one wall to the other between the regular floor-beams, and do not touch the floor at any point. If, now, a table is made to rest on two of these beams, by making holes in the floor over them to admit the legs of the table, it is entirely undisturbed by any one walking over the floor, except by such motion as is transmitted to the walls. There will also be a small vertical shaft in the wall of the tower, running from top to bottom, in which a mercurial manometer may be set up.

The vaults for constant temperature have been built with double walls, so that a current of air may be drawn between them whenever desirable to prevent dampness. It is expected that the laboratory will be ready by October next.

The photographic map of the spectrum, upon which Professor Rowland has expended so much hard work during the past three years, is nearly ready for publication. The map is issued in a series of seven plates, covering the region from wave-length 3100 to 5790. Each plate is three feet long and one foot wide, and contains two strips of the spectrum, except plate No. 2, which contains three. Most of the plates are on a scale three

times that of Angström's map, and in definition are more than equal to any map yet published, at least to wave-length 5325. The 1474 line is widely double, as also are b_3 and b_4, while E may be recognized as double by the expert. In the region of the H line these photographs show even more than Lockyer's map of that region. Negatives have also been prepared down to and including the B group, and they may be made ready for publication, one of which shows eleven lines between the D lines. A scale of wave-lengths is printed on each plate, and in no case does the error due to displacement of the scale amount to one part in fifty thousand. The wave-lengths of over 200 lines have been determined to within one part in five hundred thousand, and these serve as reference lines to correct any small error in the adjustment of the scale. The great value of such a map lies not only in the fact that it gives greater detail and is more exact than any other map in existence, but that it actually represents the real appearance of the spectrum in giving the relative intensities and shading of groups of lines so that they are readily recognizable. The photographs were taken with a concave grating six inches in diameter, and having a radius of curvature of 21½ feet, and the photographs were taken when the plate was placed directly opposite the grating; both the sensitive plate and grating being perpendicular to a line joining their centres, and placed at a distance apart equal to the radius of curvature of the grating, the slit being on the circumference of the circle, whose diameter is the distance between the grating and plate. With this arrangement, the spectrum is photographed normal for wave-lengths without the intervention of any telescopes or lens systems; and a suitable scale of equal parts applied to such a photograph at once gives relative wave-lengths.

Few persons have any idea of the perseverance and patience required to bring such a task to a successful issue. More than a year was devoted to preliminary experiments designed to discover the best mode of preparing the plates for the particular regions to be photographed. Hundreds of preparations were tested to find their influence on the sensitized plate, and the whole literature of photography was ransacked, and every method tested to the utmost, before the work of taking the negatives could begin.

The Rogers-Bond comparator, which has been already referred to as having been purchased by the university lately, is one of two instruments that were constructed in 1881 by Pratt & Whitney of Hartford, Conn. The general plan and requirements were made out by Prof. W. A. Rogers of Cambridge, and the drawings and details were worked out by Mr. George M. Bond, then a student at Stevens institute. The comparator was designed for making exact comparisons of standards of length. The other similar comparator is owned by the Pratt & Whitney manufacturing company, and is used by them in testing and constructing their standard gauges.

The instrument consists essentially of two microscope carriages, which slide on two parallel cylindrical steel ways between stops, which may be clamped at any point. A carriage entirely independent of the ways on which the microscopes slide, supports the two bars to be compared, and is provided with means of accurate and rapid adjustment, by which the bars may be successively brought into position under the microscopes, and the lengths compared by the micrometers attached to the microscopes; or one microscope only need be used, and slid first against the stop at one end, and then against that at the other end. The instrument also affords great facility in determining fractions of a given length with any desired degree of precision. The instrument is one requiring the utmost skill in its construction, and it cost several thousand dollars to make it. A full account of this remarkable instrument is given in the Proceedings of the American academy of arts and sciences for 1882–83. K.

NORTH CAROLINA COAL-FIELDS.

THE coal-deposits of North Carolina have recently been examined by Dr. H. M. Chance,[1] under the direction of the North Carolina state board of agriculture, with the view of determining their commercial value.

There are two isolated triassic areas in North Carolina in which coal has been mined, — one on Deep River, and the other on Dan River. Dr. Chance's explorations in the Deep River coal-field consisted mainly in a re-examination of the coal outcrop, which follows the west border of the area, and passes through Farmville, Gulf, and Carbonton. The various sections obtained show that in general there are two workable coal-seams in this field, as was proven long ago in the Egypt shaft and at several mines along the coal outcrop. The upper seam averages 2.5 to 3 feet, and the lower 2 feet in thickness. In the Egypt shaft the upper coal measured 4 feet, and the lower 1 foot 10 inches; twenty-seven feet below the lowest of these workable seams, another, 1 foot thick, was penetrated. At Gulf three workable seams outcrop, but their thickness is variable owing to

[1] *Report on the North Carolina coal-fields to the department of agriculture* [of North Carolina]. By Dr. H. M. CHANCE. Raleigh, 1885. 66p., 3 maps. 8°.

disturbances due to trap-dikes and faults. The dip of the coal-seams is in general S. E. 25–30°.

Several new analyses of the coal of this area are presented, some of them being of average samples from large quantities. The coal is 'bituminous,' as is shown by the following average of a large number of analyses: volatile matter, 30; fixed carbon, 54; ash, 12; sulphur, 3.6 per cent. At times the coal has been altered to a semi-anthracite, and even to a natural coke, by the heat of trap-dikes.

The expense of working the coal in seams 2 feet thick is estimated at $1.50, and in seams 3 feet thick at $1.20, per ton. In the mines of Tennessee and West Virginia, with which the North Carolina coal comes in competition, mining is carried on at the rate of about 65 cents per ton. Combining these figures with the cost of transportation, it is shown that there would remain a sufficient margin in favor of Deep River coal to command the market in eastern North Carolina. This is favorable to the development of the Deep River deposits: still the fact that these mines have not been worked for many years is significant.

The Richmond coal-field, which is of the same age and of the same general character as the Deep River deposit, but in which coal occurs in much thicker seams, and in general is of better quality, has also been a failure, when the mining operations of the whole field are considered. It is evident, therefore, that there must be some sufficient reason why mining in these fields, which are in close proximity to good markets, has not succeeded. Dr. Chance enumerates some of the more obvious difficulties that present themselves in the Deep River area: there are variations in the thickness and quality of the seams, faults, trap-dikes, presence of explosive gas, water, spontaneous combustion, and absence of coal from certain areas. Nearly all of these obstacles are probably much more difficult to surmount in these mines than in the great coal-fields to the west, with which the North Carolina coal comes in competition. To the present writer, who has recently examined all of the triassic areas south of the Potomac, it appears that the difficulty in the way of economical mining in the various triassic coal-fields arises mainly from the structure of the deposits. All of these areas are extensively faulted, and are traversed by an extended system of trap-dikes. Along the faults the coal has been so completely crushed that it is usually of little commercial value. At the same time, the continuity of the beds has been broken, and their dip disturbed and rendered irregular.

This wide-spread disturbance renders the expense of working the coal extremely uncertain, mainly on account of the difficulty of following faulted beds. The numerous trap-dikes that intersect the triassic areas north of the Potomac have caused disturbances which are even more injurious to the coal-deposits than the effects of faulting. The dikes are frequently accompanied by a displacement of the beds on either side, and also by an alteration of the adjacent coal. At times the coal in proximity to the dikes has been ruined by the heat; but in some instances, however, a natural coke has been produced which is more valuable than the unaltered coal. Trap-dikes more than a few feet thick are so expensive to penetrate that they are practically insurmountable obstacles when met with in coal-mines. This was the case in certain mines formerly worked at Gulf. Again, the trap sometimes penetrates the coal-bearing strata in intrusive sheets, approximately parallel with the planes of bedding, and in these even more troublesome to the coal-miner than when it forms vertical dikes.

A study of the numerous mining operations that have been carried on, commonly with failure, in the Richmond coal-field, would illustrate the peculiar difficulties to be expected in the Deep River basin. The lack of success in so many mining ventures in the triassic areas south of the Potomac, owing to the disturbances that have affected the coal, proves conclusively that mining should not be undertaken in the triassic coal-fields of the south without a careful preliminary examination with a diamond drill of the entire property that it is proposed to work. The quantity, quality, and position of the coal should be accurately determined before expensive mining operations are begun. With these precautions, it is probable that portions of the Deep River coal-field can be developed with profit, but it is safe to predict financial failure for those who begin mining with the expectation of working continuous coal-seams in the manner followed in West Virginia and Pennsylvania.

The coal-deposits on Deep River were also examined by Dr. Chance, who pronounces them to be valueless for commercial purposes.

This report will be of value to those interested in the coal-deposits of North Carolina, but it contains little that can be considered as a contribution to geology. I. C. RUSSELL.

THE AMERICAN FERRET.

ALTHOUGH the philosophical biologist measures the importance of a species by the light it throws upon the problem of the science which he cultivates, there are certain animals and plants which, while not intrinsically of unusual importance, enjoy a special prominence on account of their

brilliant coloring, the grotesqueness of their form, or their rarity. A rare species has the same interest for a collector of natural objects as a rare book for a bibliomaniac. Be its importance real or nominal, its rarity recommends it, because men tire of that with which they are familiar.

The American ferret (Putorius nigripes, Audubon and Bachman), of which we offer a representation, is one of the least known of North American mammals, and is but rarely met with in collections. It was described by Audubon and Bachman in 1851 from a single specimen, and a quarter of a century passed before our knowledge of the species was in any wise augmented. In 1874, Dr. Coues advertised his desire for specimens in certain sporting papers, and was gratified to receive for the Smithsonian institution several examples from different localities.

Since that time quite a number of specimens have accumulated in the national museum and some other establishments.

THE AMERICAN FERRET.

Of the habits and distribution of the black-footed ferret, we still know very little. The specimens thus far recorded are from Texas, Kansas, Nebraska, Colorado, Montana, and Wyoming. The species probably ranges over the greater part of that section of the United States lying between the Mississippi River and the Rocky Mountains.

The specimens of which the history is known were taken from prairie-dog holes; and Dr. Coues states that about Fort Wallace, Kansas, the species is said to be known as the 'prairie-dog hunter.' Dr. Hayden found the remains of a prairie-dog in the stomach of a ferret which he sent to the Smithsonian institution.

In his work upon the weasels, Dr. Coues established a special sub-genus, Cynomyonax, for the black-footed ferret, and in 1881 Hensel made the species synonymous with the Putorius Eversmanni of Siberia. It seems very improbable, however, that Hensel's view is correct.

The specimen figured was obtained for the Smithsonian institution by Capt. James Gillis, at Cheyenne, Wyoming. The head and body measure 19 inches (following the curves); the tail, including the terminal pencil, 5¼ inches. F. W. TRUE.

A CLERGYMAN has just been committed to prison in England for seven days as a penalty for striking a constable. The assailant was coming out of his house, when the policeman, who happened to be waiting to serve a summons, laid the document on his arm. His reverence exclaimed, "You brute, how you did frighten me!" and struck the constable a violent blow in the face with a candlestick. In commenting on this case, the *Lancet* says that it should not be forgotten that in many instances the immediate effect of a 'fright' is to make the person startled strike out with any thing at hand. Some persons are paralyzed by panic: others are instantly roused to action in a way that does not involve volition. The blow is as much the result of the excitation as the knee-jerk produced by striking the patellar tendon, albeit the train of actions is more complex, and involves the exercise of that co-ordinative faculty which has been called the sub-consciousness. In stumbling we make certain movements with the feet, and clutch at any thing that may be within reach in a manner designed to prevent or minimize the effect of a fall. A good horseman will, 'instinctively,' as we say, take such precautions as will prevent his being hurt by a fall. The will is not *intentionally* active in these processes. The recognition of the danger, and the adoption of suitable measures, seem to occupy too short a time for thought.